


INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 115804 Veri10/sko	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/NO 03/00401	International filing date (day/month/year) 01.12.2003	Priority date (day/month/year) 30.11.2002
International Patent Classification (IPC) or both national classification and IPC B63B5/14		
Applicant DET NORSKE VERITAS AS et al		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 4 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input checked="" type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 25.06.2004	Date of completion of this report 15.03.2005	
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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO 03/00401

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-17 as originally filed

Claims, Numbers

1-28 received on 27.12.2004 with letter of 21.12.2004

Drawings, Sheets

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/NO 03/00401**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
- (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
 - ☒ claims Nos. 28
- because:
- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
 - ☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 28 are so unclear that no meaningful opinion could be formed (*specify*):
- see separate sheet**
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
 - ☐ no international search report has been established for the said claims Nos.
2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:
- ☐ the written form has not been furnished or does not comply with the Standard.
 - ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-27
	No: Claims	
Inventive step (IS)	Yes: Claims	26,27
	No: Claims	1-25
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NO 03/00401

see separate sheet

1. D1 (FR-A-2782695), see especially page 1, lines 24-34, 39-42 and 48-51, suggests the subject-matter of independent claims 1 and 2.

D1 mentions a layered structure to be used in building marine vessels and a marine vessels where the whole or part comprises a layered structure including two substantially parallel metal sheets with a concrete layere inbetween, where the concrete has a density significantly less than that of normal concrete, and less than about 1200 kg/cubic meter.

The skilled one knows that concrete has a relatively high resistance for compression and relativeley low resistance for tension.

The text of D1 makes the reader aware of the weak performances of the "light weight" concrete for tension and also for compression, and specifies that it may be reinforced in order to improve its mechanical qualities. It is therefore obvious for one skilled in the art that the structure according to D1 has to be dimensioned taking that into account.

It is also to be mentioned that the text of claim 1 does not give any indication of values or relativevalues for the stress resistance, and as such leaves the precise choice to the skilled one in accordance with his general knowledge and particular circumstances.

D1 clearly indicates to the skilled on the limitations of such layered structure and the options available for his choice.

2. D1 in combination with D2 (JP-57-026076 Abstract) suggests the method according to independent claim 18.

D1 does not specifically mention the steps to produce the layered structure, nor a method for improving the carrying capacity of existing structures.

D2 mentions a method of manufacturing a combined concrete panel made of a pair of parallel steel sheets with girder webs at a required distanceand filling the space with concrete.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NO 03/00401

The only difference between the method according to independent claim 18 and the disclosure in D2 resides in the specific density of the concrete.

It appears obvious for one skilled in the art that the same method may be applied for the "light weight" concrete known from D1, as D1 already mentions moulding of the concrete, see page 1, lines 18-19.

3. There is no suggestion in the available prior art as to a corrugated structure as per independent claim 26, however a clarity objection has to be raised for the case of a corrugated plate embedded in concrete between two (flat) parallel sheets of metal.
4. The text of independent claims 1, 2 and 26 is construed not to be clear as to what concerns the dimensioning of the layered structure which represents an attempt of definition by result.

Concerning claim 26 it is not clear how the structure is "improved" otherwise than by the definition in the claim.

The text of claim 28 lacks clarity insofar that it is not possible to recognise on the mentioned structures the method steps according to which they have been produced. As such a pertinent analysis as to novelty and inventive step is not possible.

5. The description is not harmonised with the claims.

The pertinent prior art according to D1 and D2 is not acknowledged in the description.

The problem and solution approach is not properly applied, as the available prior art is closer than the one acknowledged in the application.

CLAIMS

1. Marine vessel, such as ships, floating platform etc, where the whole or part(s) comprises a layered structure including two substantially parallel metal sheets with a concrete layer in between, where the concrete has density significantly less than that of normal concrete, preferably less than about 1200 kg/m^3 , where the layered structure is dimensioned as if the concrete layer in the structure carries essentially no tension but is capable of carrying compressive forces and support the metal sheets.
2. Layered structure for use in marine vessels, such as ships, floating platforms etc, comprising two substantially parallel metal sheets with a concrete layer in between, where the concrete has weight of less than for normal concrete, preferably less than 1200 kg/m^3 .
3. Marine vessel or layered structure in accordance with claim 1 or 2, wherein the metal sheets on the surface faced towards the concrete layer comprises means to increase the bonding or connecting properties between the metal sheets and the concrete layer.
4. Marine vessel or layered structure in accordance with claims 1 or 2, wherein the means to increase the bonding properties are an increased roughness in the surface of the metal sheets, or an added adhesive layer or dowels or a combination of these.
5. Marine vessel or layered structure in accordance with claim 4, wherein the dowels reaches a substantial distance into the concrete layer, and at most to the metal sheet on the opposite side of the layered structure.
6. Marine vessel or layered structure in accordance with claims 1 or 2, wherein there in the concrete layer in the layered structure are added fibres to enhance the concrete layer's ductility, reduction of crack openings, and capability for carrying tension forces.

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PCT/NO2003/000401

7. Marine vessel or layered structure in accordance with claims 1 or 2, wherein there between the two metal sheets is at least one connector.
8. Marine vessel or layered structure in accordance with claim 7, wherein the connector comprises a point connection.
- 5 9. Marine vessel or layered structure in accordance with claims 7 or 8, wherein the connectors comprises girders in at least one direction.
- 10 10. Marine vessel or layered structure in accordance with one of the proceeding claims, wherein the concrete layer comprises a plurality of longitudinal substantially parallel load carrying channel elements with equal or different cross sections and with an internal void, which may, together with other elements in the layered structure, form spar-boxes.
11. Marine vessel or layered structure in accordance with claim 10, wherein the channel elements are connected to the adjacent metal sheets with spacers.
- 15 12. Marine vessel or layered structure in accordance with claim 10, wherein the two sides of the channel elements that are oriented perpendientar to the metal surface sheets extend beyond the closed channel form to be attached directly to the two metal sheets.
- 20 13. Marine vessel or layered structure in accordance with claims 10,11 or 12, wherein both open ends of channel elements are joined with girders with longitudinal direction transverse to the channel element's longitudinal direction and form closed spar-boxes.
14. Marine vessel in accordance with claim 13, wherein there is access to at least one of the spar-boxes in the layered structure, and the spar-box may function as a service shaft and/or inspection shaft or similar.

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15. Marine vessel in accordance with claim 14, wherein there is access to the spar-boxes in the concrete layer in a bulkhead so that the spar-boxes may function as compartments for instance for ballast water.

5 16. Marine vessel in accordance with claim 13, wherein there is access to the spar-boxes in the concrete layer in the layered structure, so that the spar-boxes may function as compartments for fuel.

10 17. Marine vessel or layered structure in accordance with one of the preceding claims, wherein one or both of the surfaces of the metal sheets faced away from the concrete layer or the inside of a spar-box may include another outer layer of a different material.

18. Method for improving carrying capacity of existing structures, with the following steps:

- attaching at least one other plate element to the existing structure to form a void,
- 15 - filling the void with concrete with density significantly less than that of normal concrete, preferably less than about 1200 kg/m^3 to the void, and
- letting the concrete cure.

20 19. Method according to claim 18, wherein other voids in the existing structure is filled with concrete, with a density significantly less than that of normal concrete, preferably less than about 1200 kg/m^3 to the voids.

25 20. Method according to claim 18 or 19, wherein making before adding the concrete at least one aperture in the proximity of the vertical highest portion of the void to facilitate evacuation of air and for determining when the void has been fully grouted, adding concrete to the void through at least one other access to the void.

21. Method according to claim 18 or 20, wherein plate elements are attached to both sides of the existing structure to form voids.

30 22. Method according to one of the claims 18-21, wherein the existing structure is a corrugated structure having alternating mainly parallel ridges and grooves and the at least one other plate element is attached such that it covers at least one groove in the corrugated plate and thereby forms at least one void.

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23. Method according to one of the claims 18-22, wherein the plate element covering a groove in the corrugated existing structure is attached by welding or other ways of attaching the sides of the plate elements to the ridges in the corrugated existing structure.
- 5 24. Method according to one of the claims 18-20, wherein the voids are formed by plate elements attached to stiffener means being parts of the existing structure.
25. Method according to claim 24, wherein the stiffener means are modified before or after plate elements are attached to them to form voids.
- 10 26. Improved corrugated structure with alternating mainly parallel ridges and grooves, wherein it comprises on one or both sides at least one plate element, attached to the corrugates plate so that the plate element covers at least one groove and forms a void, which void is filled with a concrete with a density significantly less than that of normal concrete, preferably less than about 1200 kg/m^3 .
- 15 27. Improved corrugated structure according to claim 26, wherein all grooves on at least one side are covered by plate elements, thereby forming a smooth surface.
28. Structures in ships or vessels like for instance bulkheads, side walls, bottom structures etc with improved strength and carrying capacity made according to the method described in one of the claims 18-25.
- 20 29. Layered structure module for use in for instance a vessel such as a ship, a floating platform or similar or other structural constructions, in accordance with the layered structure in claims 2-12, wherein the module is constructed of at least two smaller elements comprising two metal sheets and a concrete layer, where the smaller element a thickness mainly equal to the modules thickness, and that the elements in addition may comprise at least one connector between the two metal
- 25 sheets so that two smaller elements when put together form two outer smooth metal surfaces.
30. Element for obtaining a layered structural module, including two substantially parallel metal sheets with a concrete layer in between, where the concrete has density less than for normal concrete, preferably less than about 1200 kg/m^3 .
- 30 31. Element in accordance with claim 30, wherein the element has a length, a width and a thickness, where the thickness and length mainly corresponds to the

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PCT/NO2003/000401

layered structure module and the width amount to a part of the layered structural module.

32. Element in accordance with one of the claims 30 or 31, wherein the element at least on one edge has a open channel element in the concrete layer, mainly
5 parallel to the metal sheets, which channel element forms at least a part of a closed channel element in the concrete layer, when two elements are joined together.

33. Method for producing a layered structure for building of whole or parts of a vessel such as ships, floating platform or similar, wherein it is used two mainly parallel metal sheets, where the metal sheets are positioned in a wanted distance,
10 and that in between these two sheets is injected an intervening layer of concrete, which concrete has a density less than for normal concrete, preferably less than about 1200 kg/m³.

34. Method for producing an element for forming a layered structure for building of whole or parts of a marine vessel, such as ships, platforms or similar, wherein it
15 is used two mainly parallel metal sheets, where the metal sheets are set in a wanted distance, and that there in between these two sheets is injected a intervening layer of concrete, which concrete has density less than for normal concrete, preferably less than about 1200 kg/m³, and that the intervening layer of concrete thereafter is allowed to cure.

20 35. Method in accordance with claim 34, wherein before the injection of the concrete, an open channel element is attached to at least one edge of the element in the centre portions of the aperture between the two metal plates.

36. Vessel, structure, structure module and element as described in the specifications and drawings.